



**Teaching for Mastery in FE:  
the high-level narrative of the  
outcomes of a large-scale RCT**

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# Context

# Centres for Excellence in Maths (CfEM)



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## Consortium involving

- ETF, including Regional Maths Leads (RMLs)
- Pearson
- Touch consulting
- University of Nottingham
- Others

## 21 CfEM – with Centre Leads - and their networks

- Action research
- Research trials

# Researching teaching for mastery

Aimed to

understand how improved teaching can lead to increased student understanding of mathematics which results in improved attainment.

**Can adopting a teaching for mastery approach lead to improved student attainment in GCSE resits?**

# Researching teaching for mastery

2019 – 20

2020 – 21

2021 – 22

2022 – 23

**Pilot study**

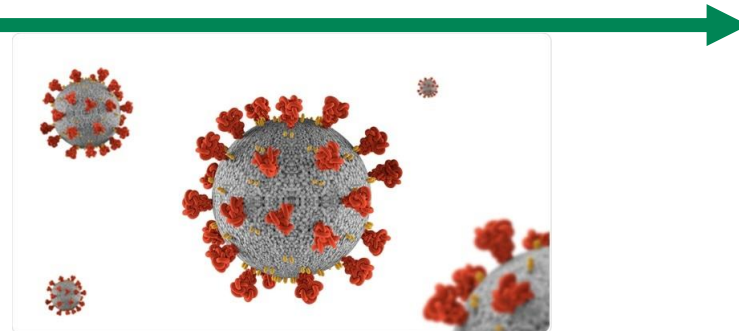
**Research  
design,  
preparation,  
recruitment**

**Randomised  
control trial**

**Analysis  
and writing  
up**

4 strands:  
Mastery  
Technology  
Contextualis  
ation  
Engagement

EDUCATION & TRAINING FOUNDATION



# TfM intervention RCT

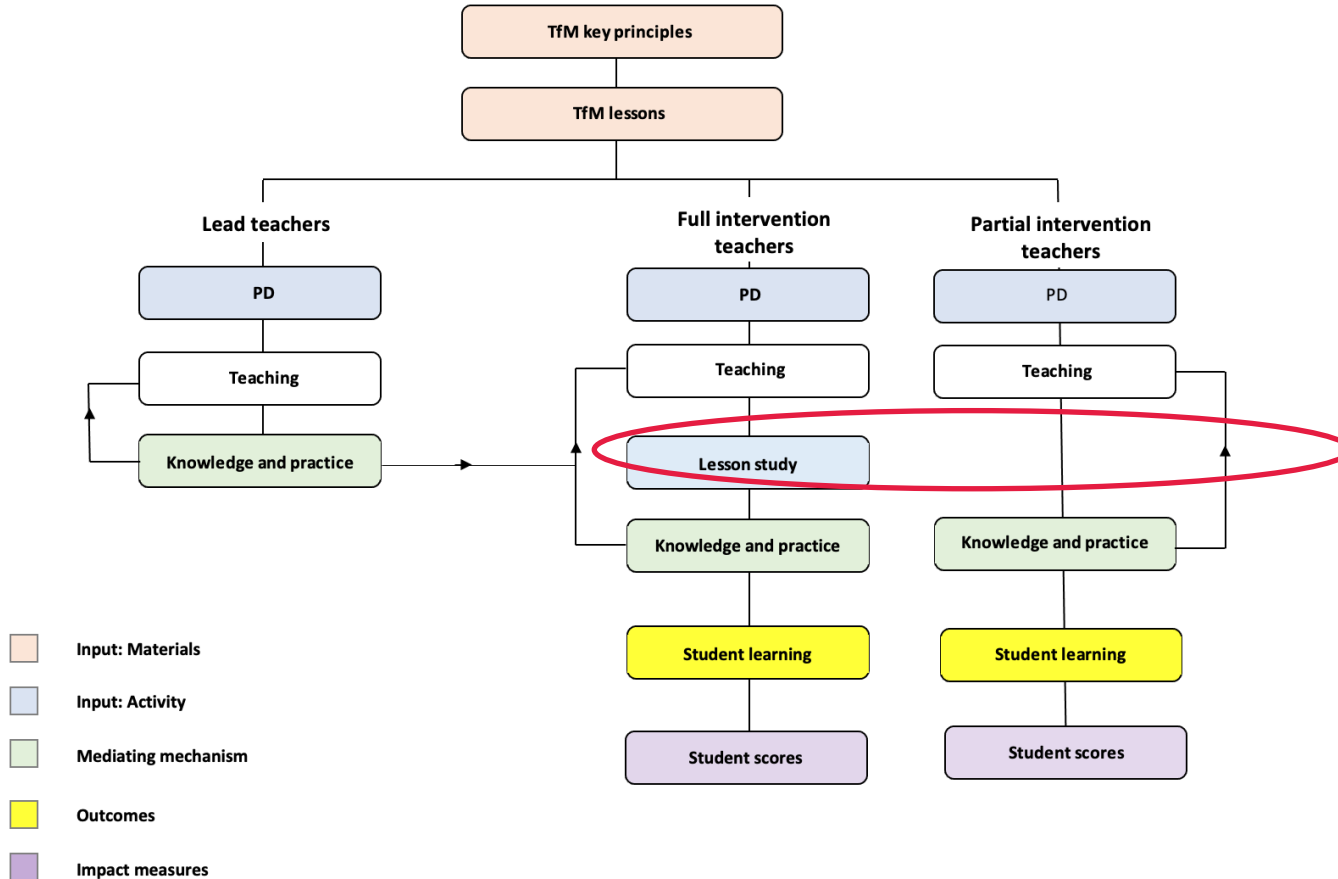
## TfM RCT: three-armed Randomised Controlled Trial

Full Intervention (Group 1)

Partial Intervention (Group 2)

Business as usual (Group 3)

# Researching teaching for mastery



# Two intervention models:

## ALL Group 1 (full intervention) and Group 2 (partial intervention) teachers:

- 3 days' professional development
- lesson materials (lesson plans, presentation, worksheets etc);
- teach the lessons at the appropriate times (Windows 1 to 5) to ALL their GCSE resit classes;
- adopt the approaches modelled by the lessons in other lessons.



# Two intervention models:

## Group 1 (full intervention) teachers:

- modified lesson study process focused on each of the five lessons 1 – 5 (cluster meetings).

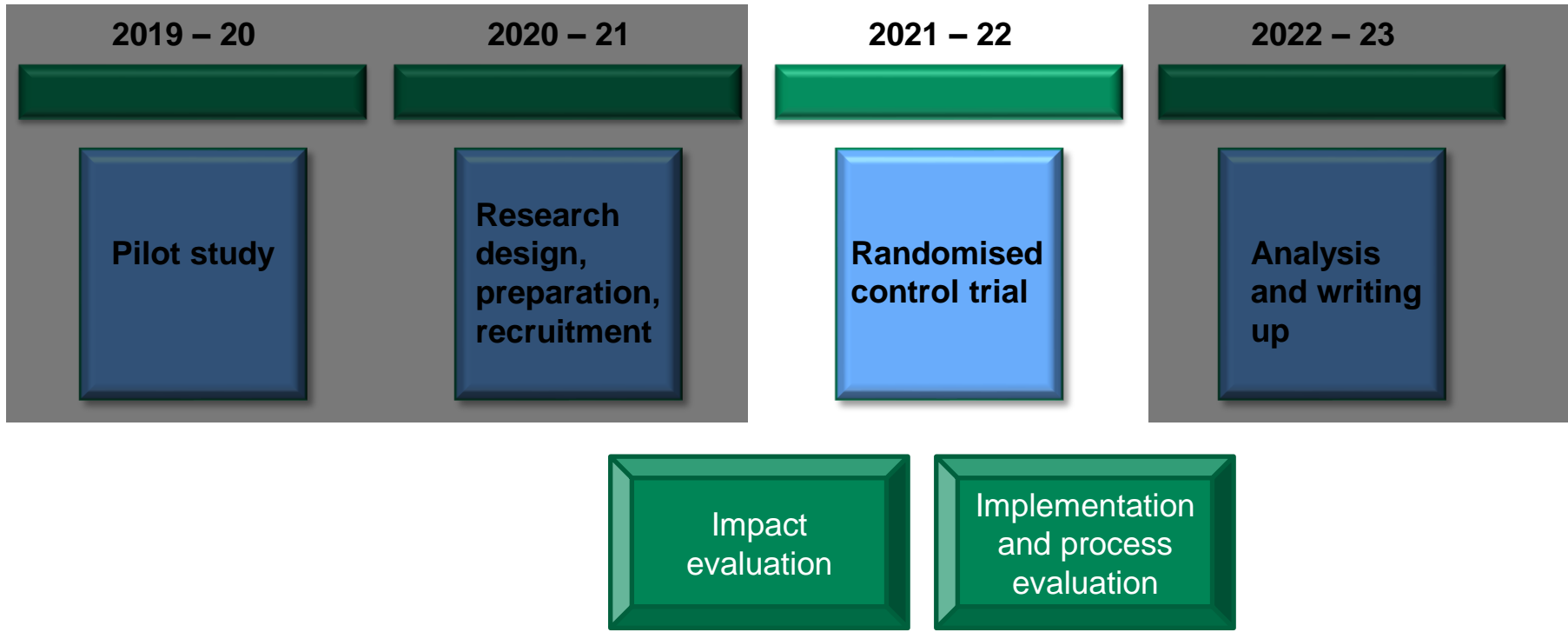
*Three planned to be face-to-face and two (lessons 3 & 4) online.*

# Cluster meetings

## Group 1 (full intervention) teachers:

- One teacher teaching the lesson
- Other teachers observe (observation sheet, research questions)
- Post-lesson discussion
  
- Preparation for the next lesson, supported by extensive guidance

# Researching teaching for mastery



# Evaluation of the trial

## **Impact evaluation**

GCSE scores of students in all groups  
(quantitative).

## **Implementation and process evaluation (IPE)**

Data about how the intervention was implemented  
(mostly qualitative).

# Research activity (IPE): quantitative data collection

## **ALL teachers and students:**

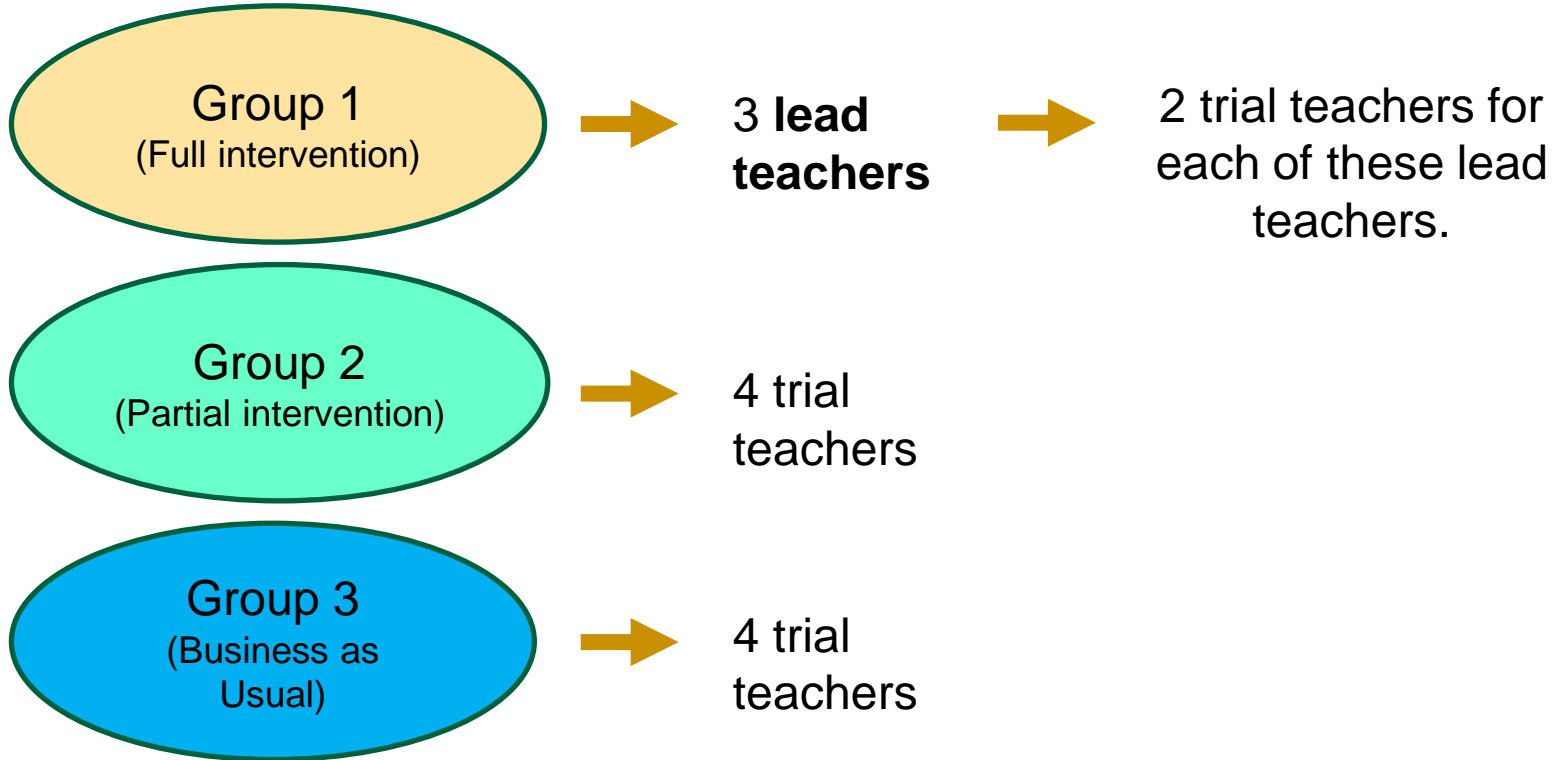
- Pre-intervention teacher survey
- Post-intervention teacher survey
- Pre-intervention student survey
- Post-intervention student survey

## **ALL Group 1 and Group 2 teachers:**

- Logs of trial lessons taught
- PD evaluations

# Research activity (IPE): qualitative data collection

## Case studies



# Research activity (IPE): case studies

## Case study teachers (Groups 1 and 2)

- Observations of lessons 1 to 5 (once or twice per lesson)
- Interviews (after the first PD sessions, lessons 2 and 4, exit)

## Case study teachers (Group 1 only)

- Student focus group interviews (twice in the year)
- Observations of cluster meetings (all meetings)



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# Teaching for Mastery in FE



# Researching teaching for mastery

Initial discussion  
document

Hackathon (led by  
Pearson)



Centres for Excellence in Mathematics

MASTERY

#### Introduction

Mastery learning is an idea that can be traced back to 1971 and the educational psychologist Benjamin Bloom. However, recent focus in England on the term has been brought about through the work of the NCETM<sup>1</sup> and the national Maths Hubs programme.

The recent NCETM iteration of mastery has been heavily influenced by practices from Shanghai (in the form of a teacher exchange) and Singapore (in the form of textbooks). The NCETM have sought to emphasise 5 big ideas<sup>2</sup> that they believe underpin mastery - coherence, representations, variation, mathematical thinking and fluency (see appendix 1). Strongly linked to the work of the NCETM two mastery textbook schemes have also been endorsed by the UK government – Maths No Problem<sup>3</sup> (KS1 to KS2) and Power Maths<sup>4</sup> (KS1 to KS2). Outside of the government backed Maths Hubs initiative, the organisation Mathematics Mastery<sup>5</sup> (linked to the Ark Academy chain) have also developed their own resources (running from KS1 to KS4).

Research on the impact of mastery includes a meta-analysis from the Education Endowment Foundation (EEF).<sup>6</sup> They summarise that mastery has a moderate impact on student progress but note that there is a large amount of variation in results, definition and application. Two other recent reports based on trials in England are also worth noting. Firstly, the EEF have evaluated the Ark Academy Mathematics Mastery scheme stating that students make a small amount of additional progress.<sup>7</sup> Secondly, Sheffield Hallam University have reported on the NCETM coordinated China-England Mathematics Teacher Exchange<sup>8</sup>. Though care should be taken in understanding the results, a reasonable summary is that there was no evidence of positive effects for 11-year olds and a small positive effect for 7-year olds. Within the FE sector there have been some small-scale ETF funded trials of mastery approaches though nothing yet providing impact on attainment.

Within the Further Education (FE) sector a number of challenges are relevant to the development of mastery<sup>9</sup>.

#### 1. Student motivation

There is a variety of student motivation depending on backgrounds, additional support needs, previous attainment and attendance.

#### 2. Resources

Schemes of work vary across settings and are seen by teachers as adaptable to allow personalisation and differentiation. This personalisation allows teachers to focus on specific areas of student weakness rather than aim for complete (re-)coverage.

#### 3. College structures

Colleges provide different structures for teaching maths within a timescale of only 6 months.

- Centralised departments compared to dispersed departments.
- Lessons ranging from 50 minutes four times per week compared to 3-hour sessions once per week.
- Students of all attainment levels in one class compared to only students targeting a level 4 in the class.

#### 4. Teacher skills and beliefs

Recruiting qualified and specialist staff can be difficult in some areas of the country. Teachers value the use of mark schemes and exam style questions to illustrate to students where additional marks can be achieved.

1



1. Develop an understanding of mathematical structure

2. Value and build on students' prior learning

**Teaching for  
Mastery:  
Five Key Principles**

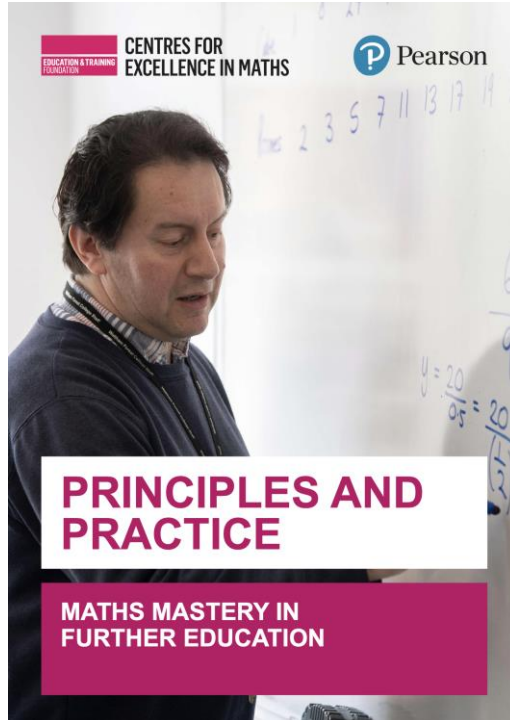
3. Prioritise curriculum coherence and connections

4. Develop both understanding and fluency in mathematics

5. Develop a collaborative culture in which everyone believes everyone can succeed



# Teaching for Mastery in FE: the handbook



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[https://www.et-foundation.co.uk/wp-content/uploads/2020/03/CfEM\\_Mastery\\_Handbook.pdf](https://www.et-foundation.co.uk/wp-content/uploads/2020/03/CfEM_Mastery_Handbook.pdf)

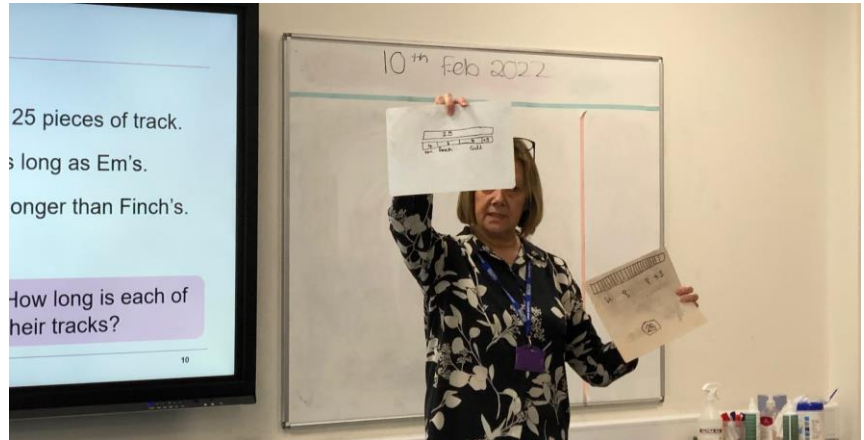
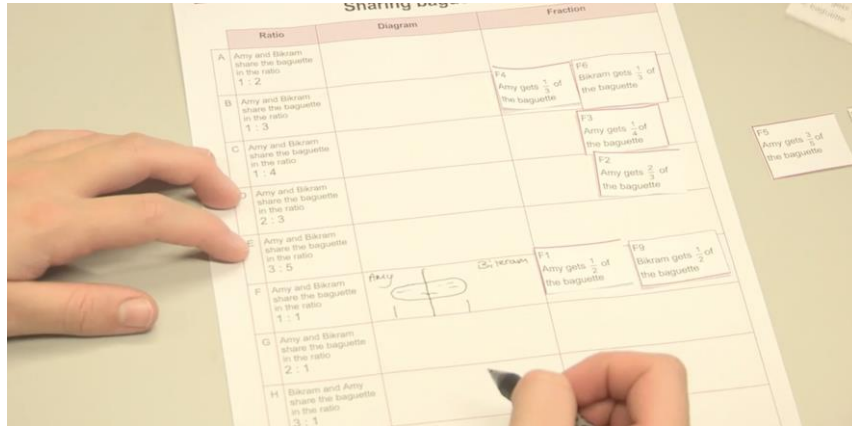
# Teaching for Mastery in FE: about the lessons

Define and inform an approach to TfM

Designed in alignment with, and exemplify, the Key Principles

Support teacher engagement with, and reflection on, TfM via two research questions per lesson

# Teaching for Mastery in FE: about the lessons



# Teaching for Mastery in FE: the lessons



ABOUT US PROFESSIONAL DEVELOPMENT PROFESSIONAL STANDARDS RESOURCES

## What's here

The resources below include brief descriptions of each of the lessons, all resources needed to teach the lesson and a links to online professional development activities which are designed to support teachers in preparing to teach the lessons.

- [Lesson 1: Multiplicative reasoning](#)
- [Lesson 2: Ratios and fractions](#)
- [Lesson 3: Factorising and multiplying in algebra](#)
- [Lesson 4: Algebraic thinking](#)
- [Lesson 5: Percentage change and best buys](#)
- [Lesson 6: Frequency charts and averages](#)
- [Lesson 7: Understanding straight line graphs](#)
- [Lesson 8: Understanding equations](#)
- [Lesson 9: Using frequencies and probabilities](#)
- [Lesson 10: Geometric reasoning](#)
- [Lesson 11: Factors and multiples](#)
- [Lesson 12: Area and volume](#)





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# Outcomes

# Implementation: Attrition

At data analysis

No. of settings:	Full intervention 39 (-15)
	Partial intervention 25 (-9)
	Control 48 (-11)
No. of students:	3390



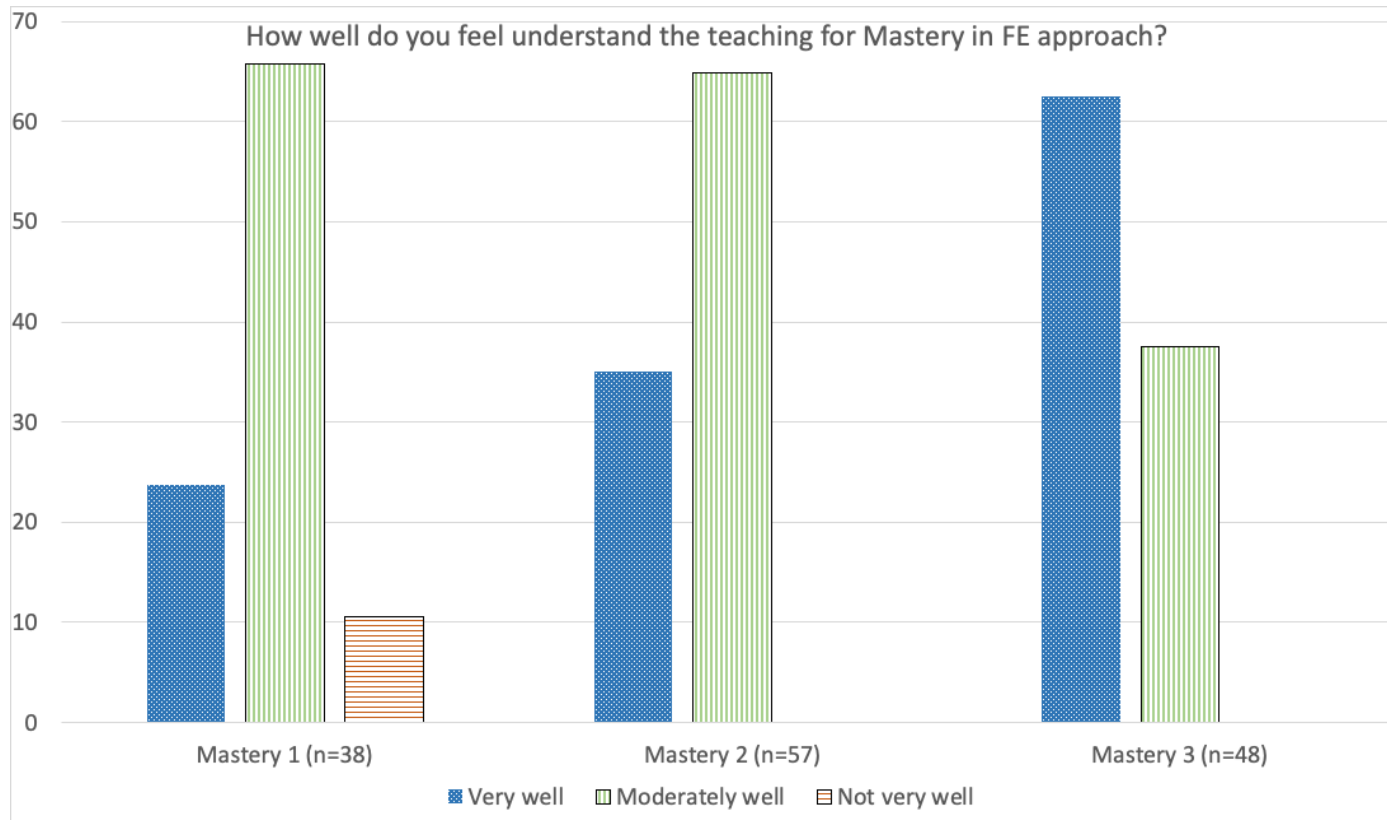
# Implementation: PD and materials

Both intervention groups reported

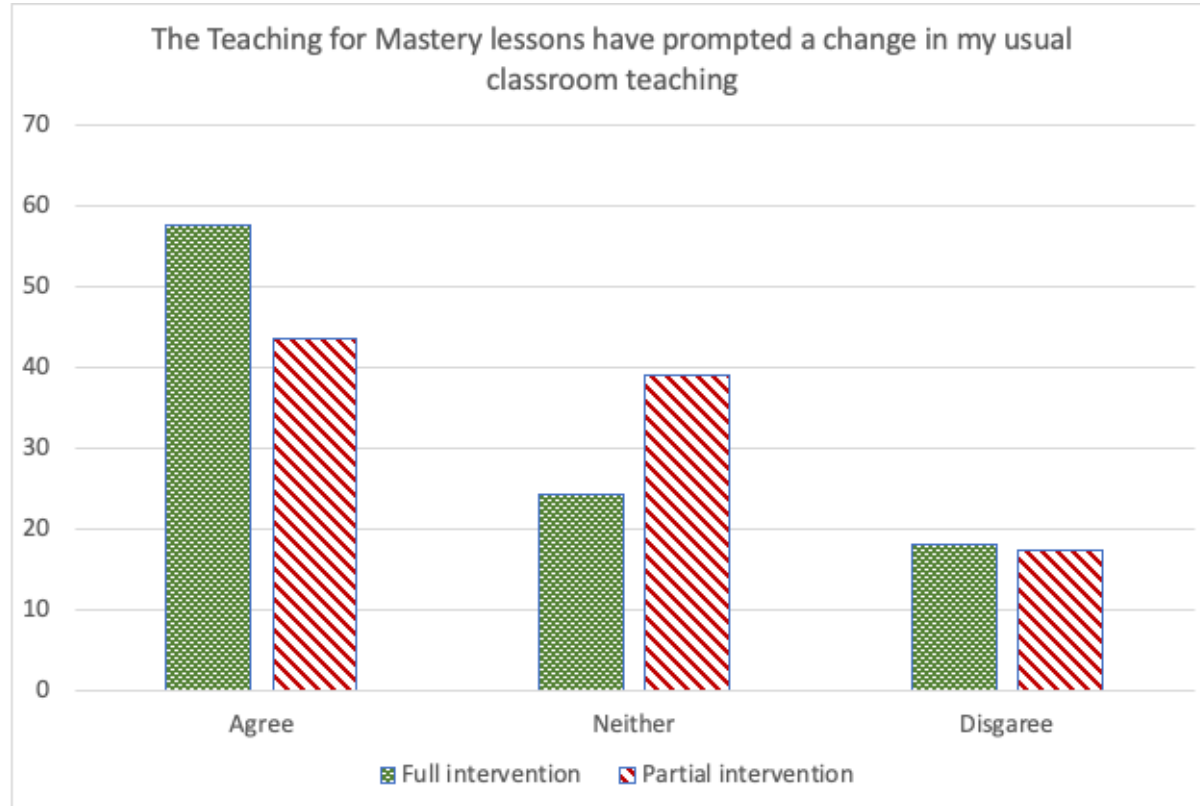
- effective as an introduction to the principles of Teaching for Mastery
- led to their improved understanding of Teaching for Mastery
- led to changes in their teaching practice and high levels of intended change in teaching practice (in subsequent years)
- led to improved student engagement and understanding.



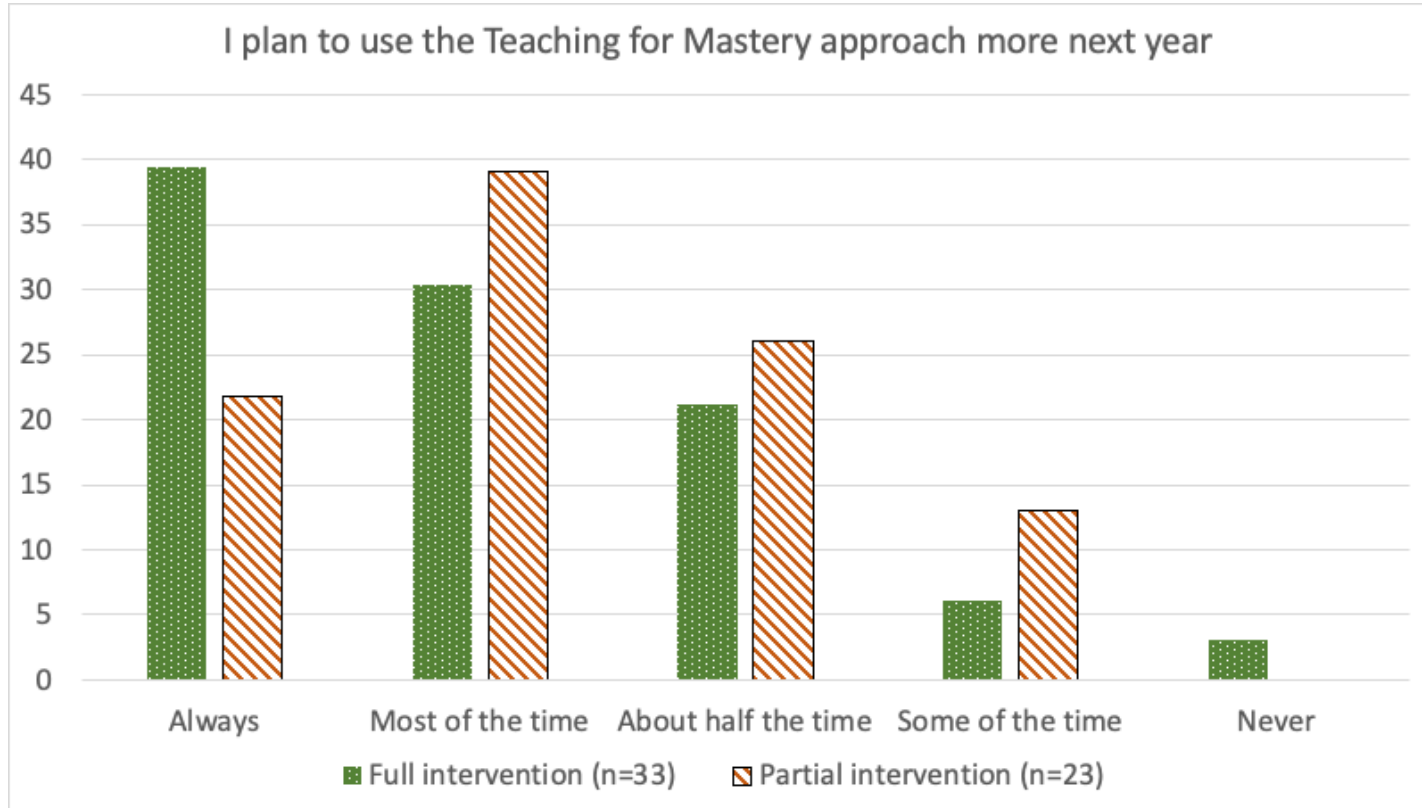
# Implementation: understanding over time



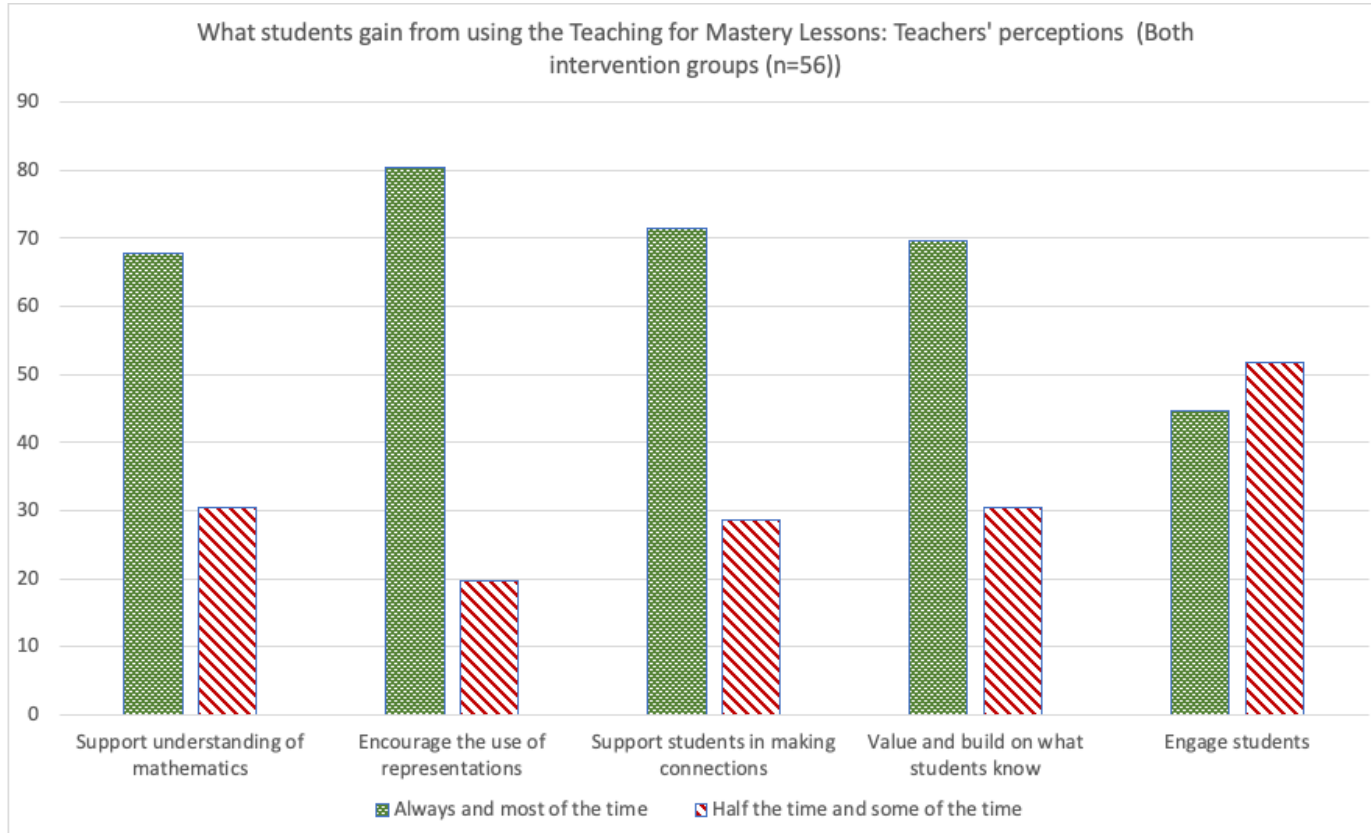
# Implementation: a change in usual teaching



# Implementation: thinking ahead



# Implementation: students



# Impact

## The post-16 'covid' cohort 2022

Year	Number Sat	7	4	1	U
2016	757296	15.9	61.0	96.5	100
2017	770034	15.5	59.4	97.0	100
2018	747169	15.8	59.4	97.0	100
2019	720098	15.9	59.6	97.7	100
2021	746880	20.6	69.2	98.4	100
2022	723450	19.9	64.9	97.5	100



# Impact

Small positive effect for each intervention model.  
Most impact FSM students in the full-intervention.

The full intervention has greater impact **against the business-as-usual control** than the partial intervention model

So...

Lesson study practices add value to the Teaching for Mastery programme in terms of impact on outcomes?

# Implementation: cluster meetings

*It's really about the research and about ... let's say the quality of the lesson and the lesson in that way, does it draw out of the student what you what we intended it to do? So the cluster meetings are an absolute fundamental part of the whole.*

*Throughout this research project, and I do feel without them, it wouldn't have been as exposed, as beneficial, as successful, as what it has been. They are, you know, they they're really important. (Case study TT149, Int 4).*



## Impact: effect sizes

The positive effect sizes (above business-as-usual practice):

- 0.06 for the full intervention
- 0.04 for the partial intervention.

FSM in full-intervention group teachers is 0.1 (we have 85% confidence in this result).

A similar differential impact for the most deprived students taught by partial-intervention group teachers is not detected

# Impact: the topics covered

GCSE questions addressed by trial lessons

- effect size of 0.13 impact on FSM students taught by teachers in the full intervention.



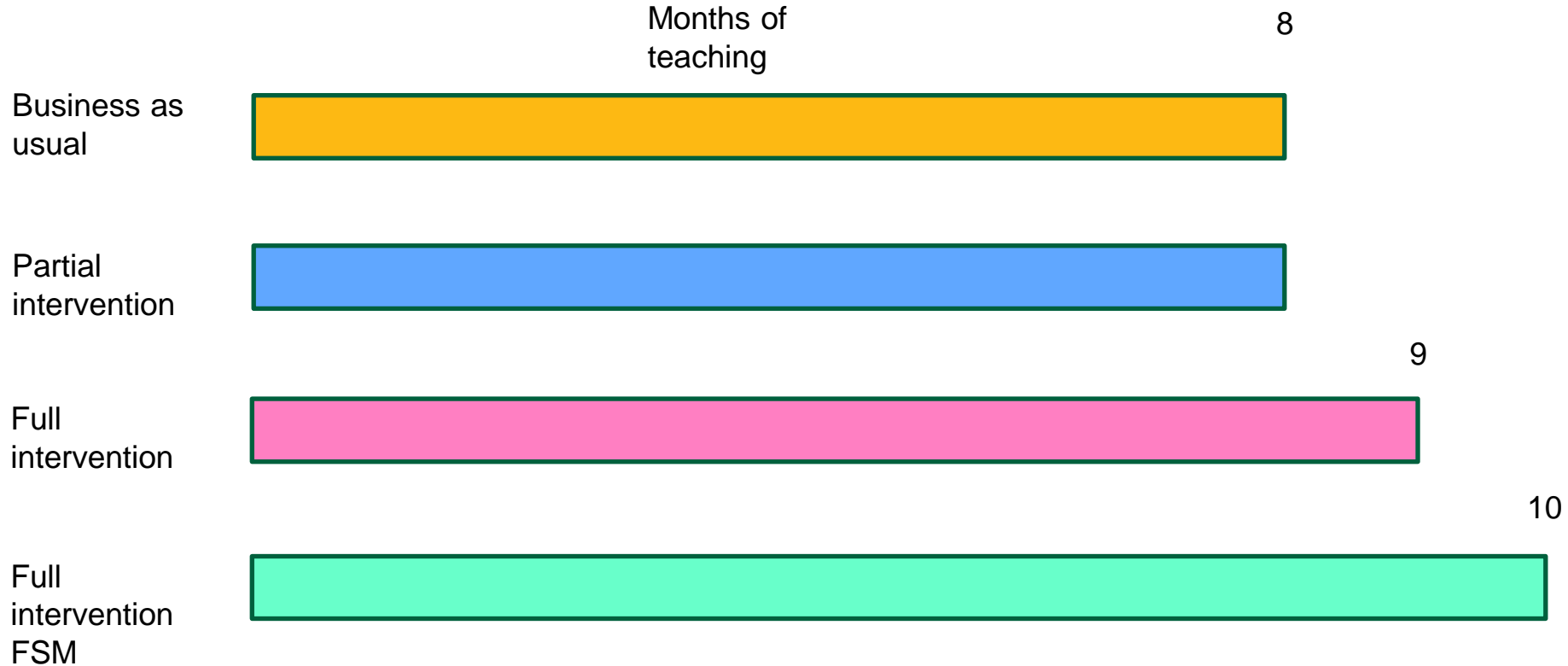
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**What does that  
mean for students  
and colleges?**

# Impact

In line with Education Endowment Foundation reporting, these effect sizes suggest



# Impact

For the full report

<https://www.et-foundation.co.uk/professional-development/maths-and-english/cfem/cfem-resources-and-evidence/cfem-evidence/mastery-randomised-controlled-trial/>





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**What next?**



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